

REMARKS

Applicants have carefully considered the December 21, 2004 Office Action, and the amendments above together with the comments that follow are presented in a bona fide effort to address all issues raised in that Action and thereby place this case in condition for allowance. Claims 1-20 are pending in this application. In response to the Office Action dated December 21, 2004, claims 1, 3, 8, 10, 13, 14, 16, 19 and 20 have been amended. Adequate descriptive support for the present Amendment should be apparent throughout the originally filed claims and disclosure as, for example, the depicted embodiments and related discussion thereof in the written description of the specification. Applicants submit that the present Amendment does not generate any new matter issue. Entry of the present Amendment is respectfully solicited. It is believed that this response places this case in condition for allowance. Hence, prompt favorable reconsideration of this case is solicited.

Claim 1-20 were objected to because of minor informalities. Applicants have amended claims 1, 3, 8, 14, 16, 19 and 20 to address the Examiner's concerns and to correct other minor grammatical discrepancies. Accordingly, Applicants request reconsideration and withdrawal of the objection of claims 1-20.

Claims 1-20 were rejected under 35 U.S.C. § 112, second paragraph. Applicants respectfully traverse. Claims 1, 8, 14, 19 and 20 have been amended to provide antecedent support for the phrases identified by the Examiner. One having ordinary skill in the art would not have difficulty understanding the scope of the presently claimed invention, particularly when reasonably

interpreted in light of the supporting specification. Accordingly, reconsideration and withdrawal of the rejection of claims 1-20 under the second paragraph of 35 U.S.C. § 112 are solicited.

Claims 1-20 were rejected under 35 U.S.C. § 102 (a or e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being unpatentable over Shinosawa et al. (U.S. Pat. No. 6,577,800, hereinafter “Shinosawa”). Applicants respectfully traverse the rejections for the reasons discussed *infra*.

Shinosawa teaches an aluminum nitride sintered body which may be used for a substrate or laser diode (column 1, lines 13 - 23) which includes a sintering aid of a rare earth element, with erbium and ytterbium both being exemplified (column 4, lines 43 - 60 and examples E5 and E6). The sintered body has a surface roughness of less than 0.5 microns with 0.05 microns with a mirror finish (column 8, lines 9 - 19). Thermal conductivity is greater than 160 W/mK with greater than 200 W/mK exemplified in Table 3. Shinosawa discloses that the thermal conductivity may be controlled by grain size of the AlN.

Applicants note that the value representing roughness of the sintered AlN body in Shinosawa is Ra, which means an average roughness. On the other hand, the roughness of the sintered AlN body according to the present claimed subject matter is represented by R max, which is the maximum roughness. The roughness Ra of the AlN substrate of Shinosawa is 0.05 micrometer or less, while the surface roughness R max of the AlN substrate according to the present claimed subject matter is 0.2 micrometer or less. It is well known in the art that the Ra is an average of the roughness of uneven surface having projections or pits/recesses formed in the surface of the body. Accordingly, if there is only one large pit or projection and numerous small pits or projections exist, the average value can become small. For example, if one pit has a depth of 5 micrometers and the other nine recesses having 0.05 micrometer, the Ra is 0.545

micrometer. On the other hand, the roughness defined by R max excludes the presence of the pits/recesses or projections that exceed the R max. The AlN substrate of the present claimed subject matter does not allow the pits or projections that exceed 0.2 micrometer, while the Ra allows pits or projection no matter how large the size. Therefore, the actual structure defined by the R max is quite different from the Ra.

According to Shinosawa, on column 16, line 56 to column 17, line 2, data shown in Table 7 (column 17) is the properties of sintered and mirror polished AlN bodies. The description on column 13, lines 36-52 states that the Ra of the mirror polished substrates is 0.05 micrometer or less. Since this process of manufacturing is the same as in the description on column 16, line 56 through column 17, line 2, the sintered bodies in Table 7 are considered to have the same Ra as in Table 4. See also, column 8, lines 8 - 14. However, the Examiner's attention is directed to Table 7, wherein the size of pit due to detached AlN crystal grain (Maximum)(gm) shows much greater values of the depth of pits. These values correspond to the R max. Although the Ra is a very small value in Shinosawa, the R max is much greater than that of the present claimed subject matter, as discussed above. That is, the Rmax in Shinosawa is 15, 10, 5, 5 and 7 micrometers, while the R max is 0.2 μ m or less, as recited in independent claims 1, 8, 14, 19 and 20. Accordingly, Shinosawa fails to disclose or remotely suggest a surface roughness R max of 0.2 μ m and, therefore, the rejections under 35 U.S.C. §§ 102 and 103 should be withdrawn.

Moreover, as described in the present disclosure, an important reason for the extremely small R max of the AlN sintered bodies of the present claimed subject matter is the employment of a hot-press sintering method. Further, AlN sintered bodies from which detachment of AlN crystal grains during machining or mirror polishing is suppressed.

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In Shinosawa, the sintering is conducted in a pressurized nitrogen atmosphere. Shinosawa does not disclose or suggest the employment of the hot-press sintering method in the AlN sintered bodies. As disclosed on page 3, line 18 through page 4 line 8 of the specification, the present sintered bodies address and solve the problems of the prior art.

It is believed that pending claims 1-20 are now in condition for allowance. Applicants therefore respectfully request an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicants' representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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